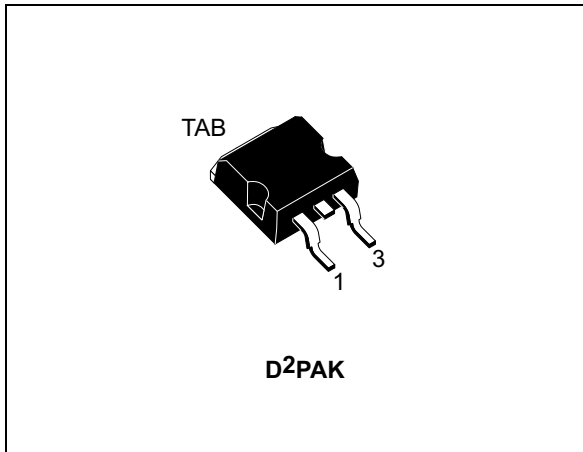


N-channel 60 V, 4.7 mΩ typ., 100 A STripFET™ F7 Power MOSFET in a D²PAK package

Datasheet - production data



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D | P _{TOT} |
|------------|-----------------|--------------------------|----------------|------------------|
| STB100N6F7 | 60 V | 5.6 mΩ | 100A | 125 W |

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Figure 1. Internal schematic diagram

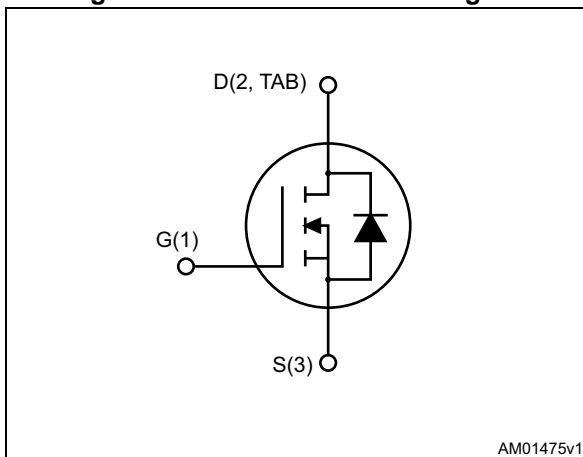


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|--------------------|---------------|
| STB100N6F7 | 100N6F7 | D ² PAK | Tape and Reel |

Contents

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|-----------------------------------------------------------------|-------------|------------------|
| V_{DS} | Drain-source voltage | 60 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 100 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 75 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 400 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 125 | W |
| $E_{AS}^{(2)}$ | Single pulse avalanche energy | 200 | mJ |
| T_j | Operating junction temperature | - 55 to 175 | $^\circ\text{C}$ |
| T_{stg} | Storage temperature | | |

1. Pulse width is limited by safe operating area

2. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 20\text{ A}$, $V_{DD} = 30\text{ V}$

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|----------------------------------|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 1.2 | $^\circ\text{C/W}$ |
| $R_{thj-pcb}^{(1)}$ | thermal resistance junction-pcb | 35 | $^\circ\text{C/W}$ |

1. When mounted on FR-4 board of 1inch², 2oz Cu

2 Electrical characteristics

($T_{CASE} = 25\text{ °C}$ unless otherwise specified)

Table 4. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|------------------------------------------------------------------|------|------|------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$ | 60 | | | V |
| I_{DSS} | Zero gate voltage Drain current | $V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$ | | | 1 | μA |
| | | $V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}, T_J = 125\text{ °C}$ | | | 100 | μA |
| I_{GSS} | Gate-source leakage current | $V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}, I_D = 50\text{ A}$ | | 4.7 | 5.6 | m Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|------------------------------------------------------------------|------|------|------|------|
| C_{iss} | Input capacitance | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | - | 1980 | - | pF |
| C_{oss} | Output capacitance | | - | 970 | - | pF |
| C_{rss} | Reverse transfer capacitance | | - | 86 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 30\text{ V}, I_D = 100\text{ A}, V_{GS} = 10\text{ V}$ | - | 30 | - | nC |
| Q_{gs} | Gate-source charge | | - | 12.6 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 5.9 | - | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 30\text{ V}, I_D = 50\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ | - | 21.6 | - | ns |
| t_r | Rise time | | - | 55.5 | - | ns |
| $t_{d(off)}$ | Turn-off-delay time | | - | 28.6 | - | ns |
| t_f | Fall time | | - | 15 | - | ns |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|------------------------------------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $V_{GS} = 0\text{ V}$, $I_{SD} = 100\text{ A}$ | - | | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 100\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 48\text{ V}$ | - | 48.4 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 47 | | nC |
| I_{RRM} | Reverse recovery current | | - | 2.0 | | A |

1. Pulse test: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

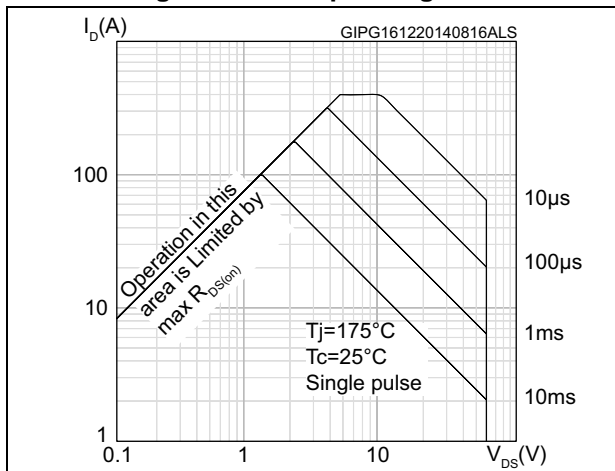


Figure 3. Thermal impedance

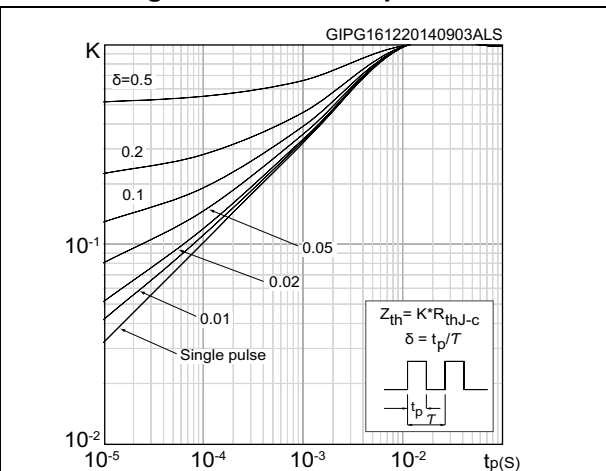


Figure 4. Output characteristics

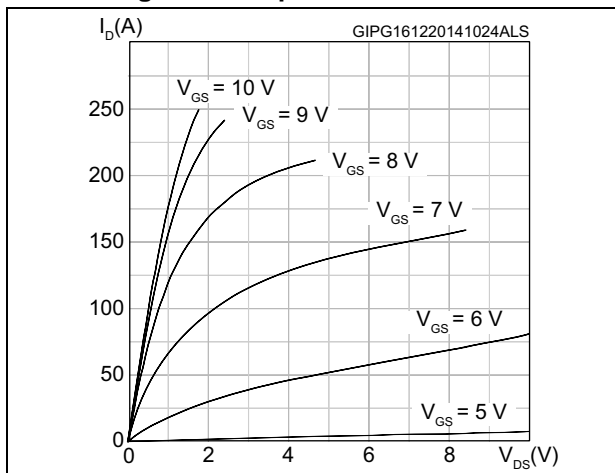


Figure 5. Transfer characteristics

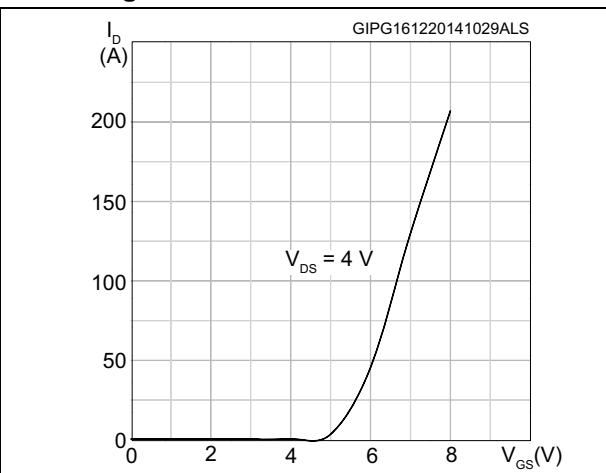


Figure 6. Gate charge vs gate-source voltage

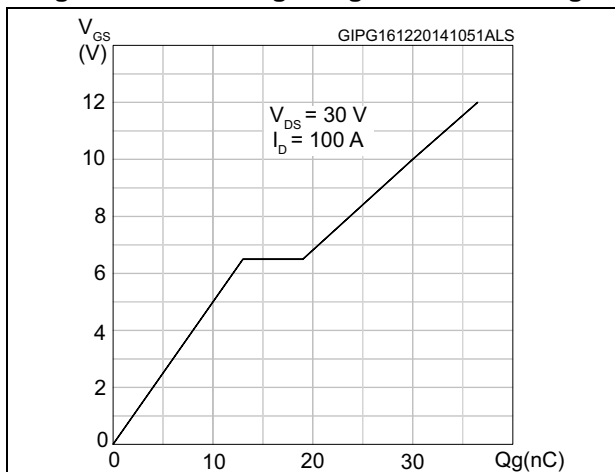


Figure 7. Static drain-source on-resistance

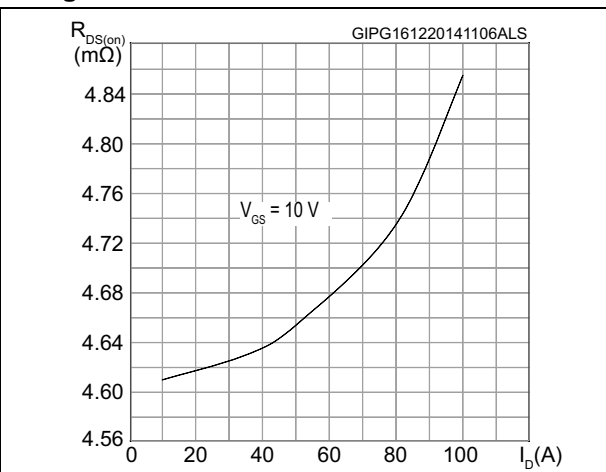


Figure 8. Capacitance variations

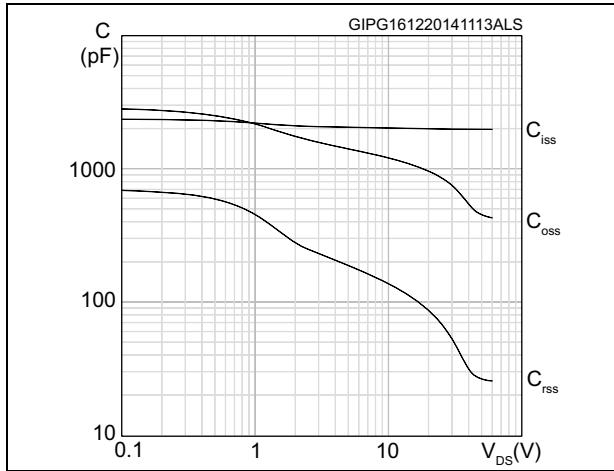


Figure 9. Normalized gate threshold voltage vs temperature

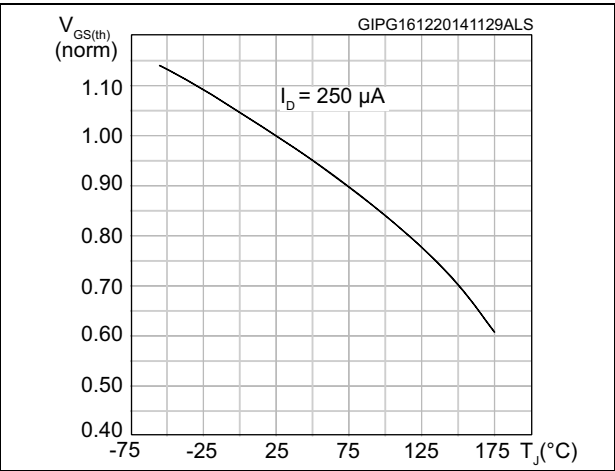


Figure 10. Normalized on-resistance vs temperature

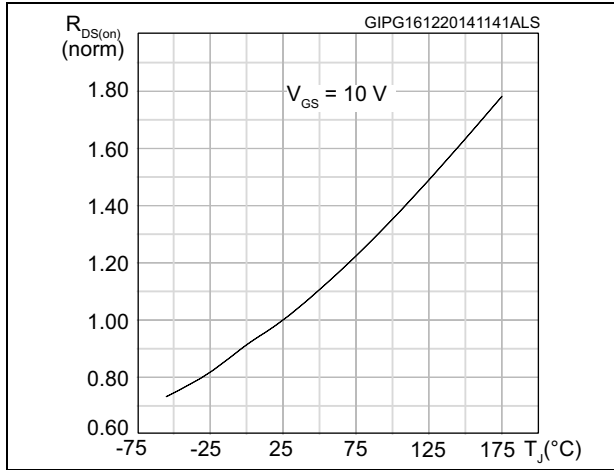


Figure 11. Source-drain diode forward characteristics

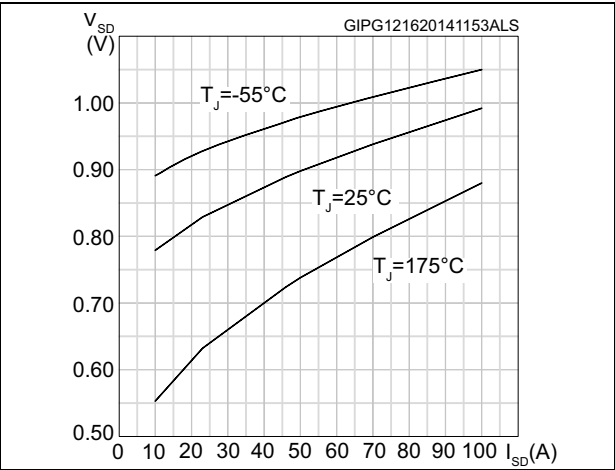
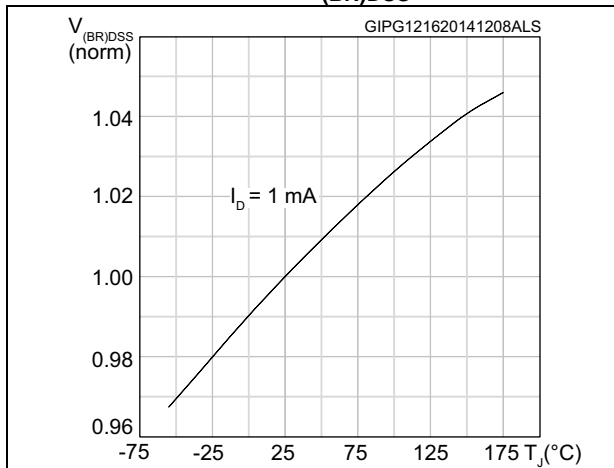


Figure 12. Normalized V_{(BR)DSS} vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit

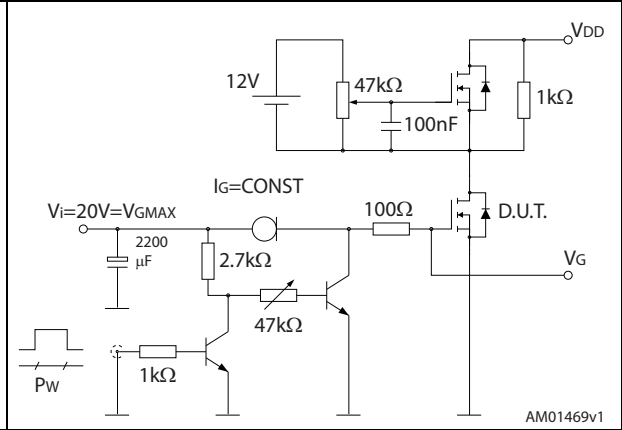


Figure 15. Test circuit for inductive load switching and diode recovery times



Figure 16. Unclamped inductive load test circuit



Figure 17. Unclamped inductive waveform



Figure 18. Switching time waveform



4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Figure 19. D²PAK (TO-263) package outline

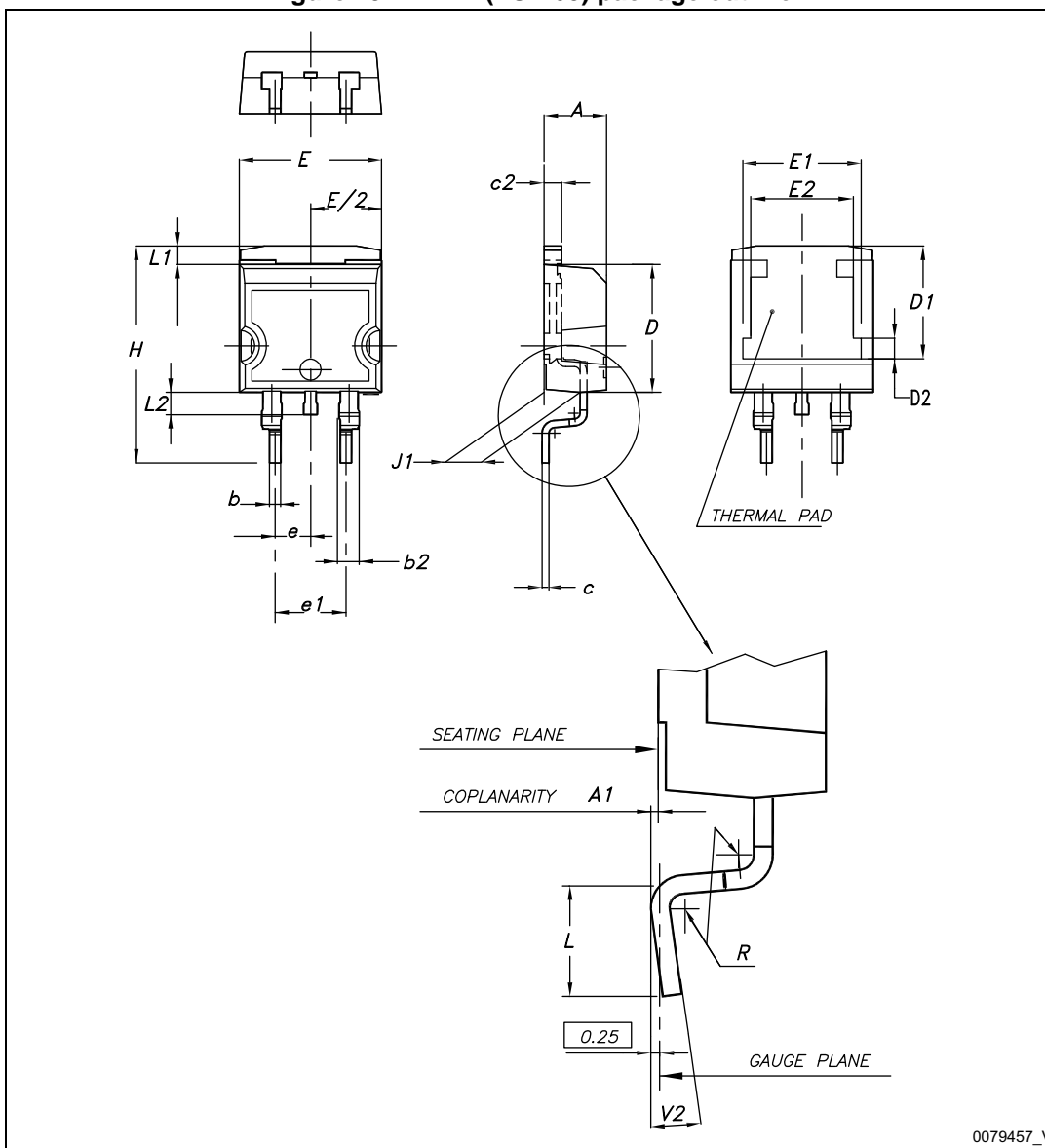
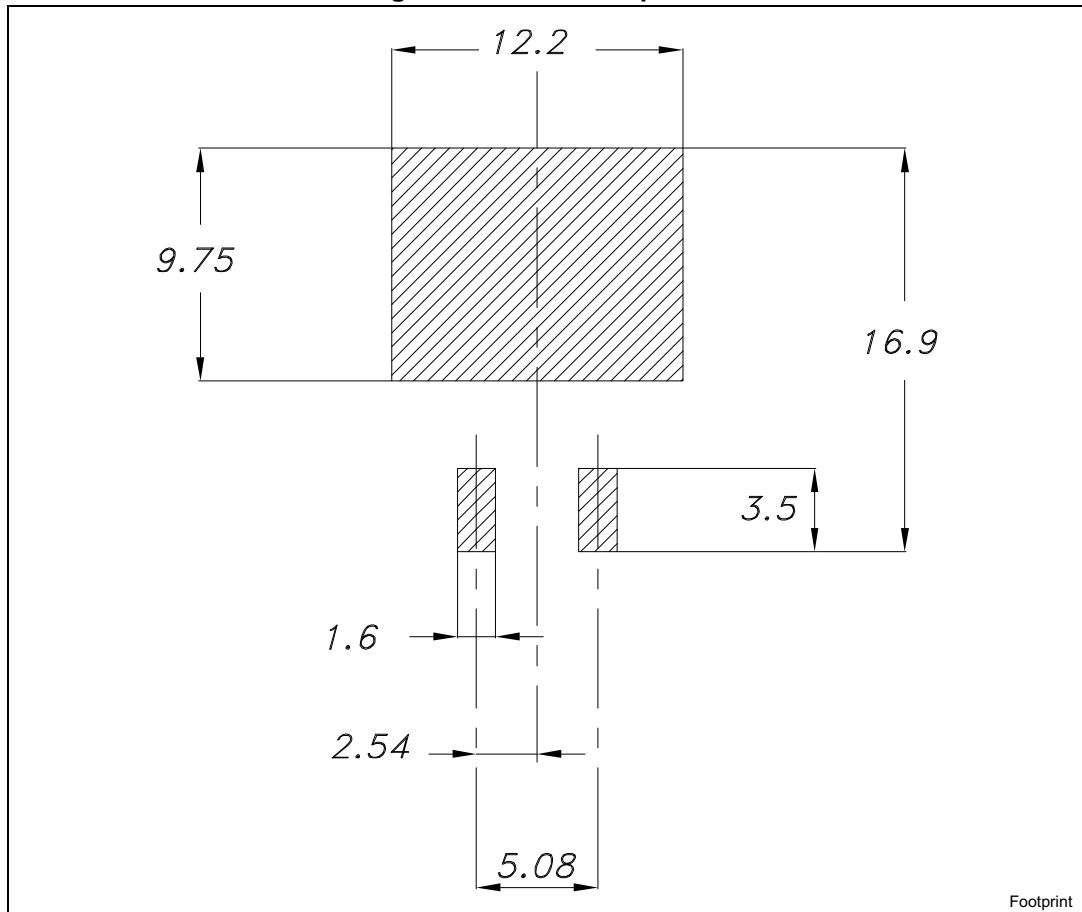


Table 8. D²PAK (TO-263) package mechanical data

| Dim. | mm | | |
|------|------|------|-------|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| A1 | 0.03 | | 0.23 |
| b | 0.70 | | 0.93 |
| b2 | 1.14 | | 1.70 |
| c | 0.45 | | 0.60 |
| c2 | 1.23 | | 1.36 |
| D | 8.95 | | 9.35 |
| D1 | 7.50 | 7.75 | 8.00 |
| D2 | 1.10 | 1.30 | 1.50 |
| E | 10 | | 10.40 |
| E1 | 8.50 | 8.70 | 8.90 |
| E2 | 6.85 | 7.05 | 7.25 |
| e | | 2.54 | |
| e1 | 4.88 | | 5.28 |
| H | 15 | | 15.85 |
| J1 | 2.49 | | 2.69 |
| L | 2.29 | | 2.79 |
| L1 | 1.27 | | 1.40 |
| L2 | 1.30 | | 1.75 |
| R | | 0.4 | |
| V2 | 0° | | 8° |

Figure 20. D²PAK footprint^(a)



a. All dimension are in millimeters

5 Packing information

Figure 21. Tape

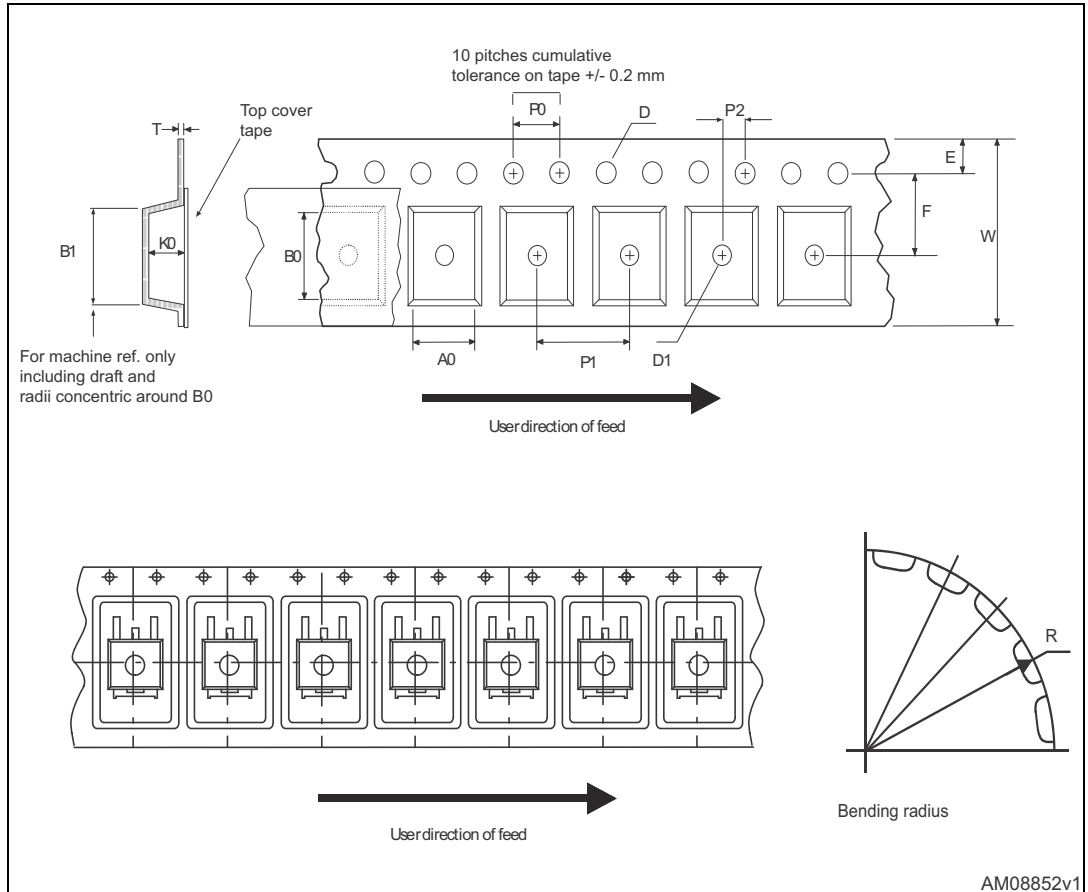


Figure 22. Reel

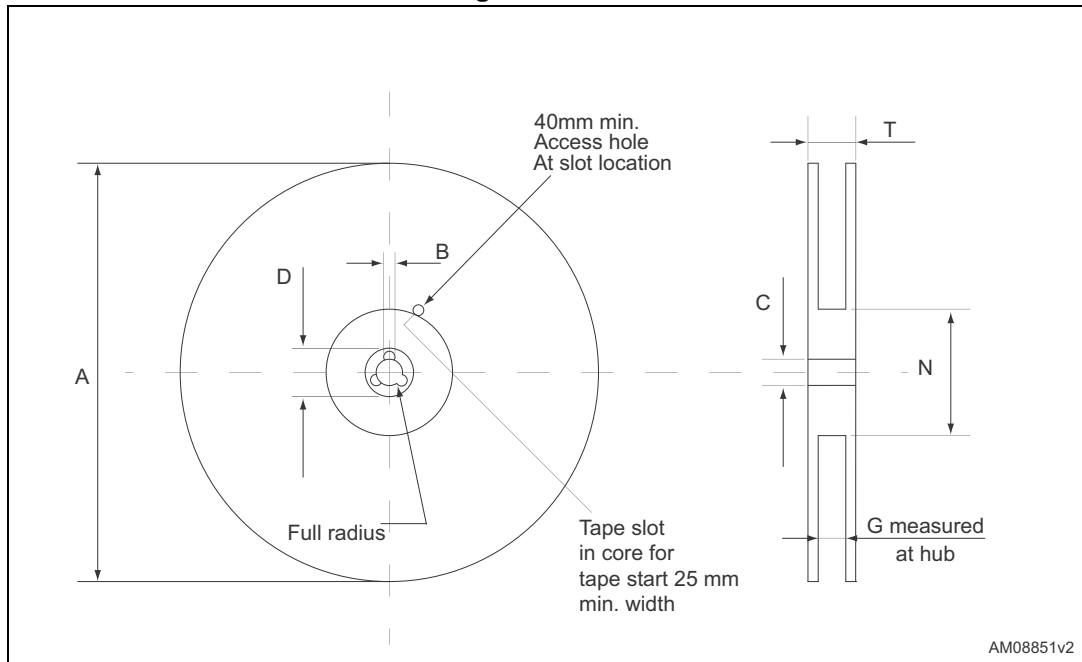


Table 9. D²PAK (TO-263) tape and reel mechanical data

| Tape | | | Reel | | |
|------|------|------|----------|------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| A0 | 10.5 | 10.7 | A | | 330 |
| B0 | 15.7 | 15.9 | B | 1.5 | |
| D | 1.5 | 1.6 | C | 12.8 | 13.2 |
| D1 | 1.59 | 1.61 | D | 20.2 | |
| E | 1.65 | 1.85 | G | 24.4 | 26.4 |
| F | 11.4 | 11.6 | N | 100 | |
| K0 | 4.8 | 5.0 | T | | 30.4 |
| P0 | 3.9 | 4.1 | | | |
| P1 | 11.9 | 12.1 | Base qty | | 1000 |
| P2 | 1.9 | 2.1 | Bulk qty | | 1000 |
| R | 50 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 23.7 | 24.3 | | | |

6 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26-Nov-2014 | 1 | First release. |
| 14-Jan-2015 | 2 | Text amendments throughout document On cover page: Changed title description Changed features and descriptions Updated Table 2: Absolute maximum ratings Updated Table 4: On/off states Updated Table 5: Dynamic Updated Table 6: Switching times Updated Table 7: Source drain diode Added Section 2.1: Electrical characteristics (curves) Updated Section 4: Package mechanical data |
| 15-Dec-2015 | 3 | Updated Table 3: Thermal data . Minor text changes. |

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